STRATEGIES FOR MANAGING THE NATION'S INVENTORY OF DEPLETED URANIUM HEXAFLUORIDE

The U.S. Department of Energy (DOE) is responsible for managing the nation's stockpile of depleted uranium hexafluoride (UF_6), most of which is now stored at three DOE sites. EAD helped DOE formulate and compare various long-term management alternatives and combinations of alternatives. EAD's effort focused on a programmatic environmental impact statement (PEIS), technical analyses, decision-making tools, and a Web site to facilitate information exchange with the public.

PROBLEM/OPPORTUNITY

The first U.S. uranium enrichment effort began in World War II as part of the Manhattan Project to develop the atomic bomb. Enriched uranium, which is used in nuclear reactors as well as weapons, is produced using the gaseous diffusion process. Depleted UF_6 is also produced in this process. The depleted UF_6 is currently stored at three DOE facilities at Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee. Since World War II, 560,000 metric tons (46,422 cylinders) of U.S. Government-produced depleted UF_6 has accumulated at these sites. In addition, the management of approximately 140,000 metric tons (11,400 cylinders) of depleted UF_6 produced by the United States Enrichment Corporation (which assumed responsibility for U.S. enrichment operations in 1993) is being transferred to DOE over time. Although DOE had been storing the depleted UF_6 with the intent of using it, a changing political environment and changing agency mission are forcing DOE to rethink its management strategy.

Since storage began in the early 1950s, many of the cylinders now show evidence of external corrosion. Moreover, there have been eight breached cylinders, with associated releases of hydrogen fluoride (HF) into the environment. The states of Kentucky, and particularly Tennessee and Ohio, have been concerned whether the material is being managed correctly. Therefore, in 1994, DOE began reconsidering its management strategy. To support this activity, DOE has needed integrated planning, environmental, and engineering capabilities. EAD, with its experience in these areas, has helped DOE in many areas of its depleted UF_6 management program, including the PEIS, supporting technical analyses, developing and using decision-making tools, and public information and outreach efforts.

APPROACH

EAD's approach to this management problem focused on developing a "cradle-to-grave" (i.e., source to disposal, conversion, or use) strategy. Different types of activities and information had to be integrated to create a strategy DOE could implement. EAD was responsible for three primary areas: preparing the PEIS and supporting analyses; developing decision-making tools; and facilitating public information and outreach.

The PEIS is constructed from a set of activity modules that can be combined into an infinite variety of alternative management strategies. The modules are based on engineering analysis. Environmental impacts are assessed for each module as well as for collections of modules. This approach provides DOE with the necessary decision-making flexibility.

To conduct the technical analyses, EAD reviewed state-of-the-art models, data, and approaches used to evaluate the health, safety, and environmental impacts associated with uranium and component chemicals. When data and models were inadequate, EAD staff developed new approaches. For example, they designed a new computer model to evaluate depleted UF_6 cylinder accidents involving fires, and they estimated how exposure to uranium compounds and chemicals used or manufactured during the processing of depleted UF_6 affected human health.

One decision tool developed by EAD is a computer program to facilitate DOE cylinder management (CMS, Cylinder Management System). Another is the Comment Response Management System (CRMS), a Web-based tool that expedited DOE responses to government and public comments about the PEIS. The structure of the CRMS makes it applicable to all other projects requiring environmental impact statements.

Results

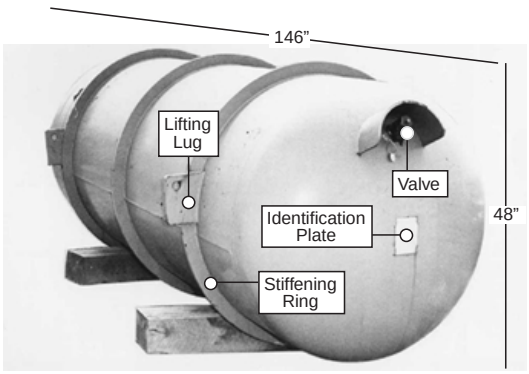
EAD staff analyzed the impacts of six broad management alternatives: no action (continued storage at current sites), long-term storage as UF_6 at a consolidated site, conversion to an oxide for long-term storage, conversion to an oxide for use, conversion to a metal for use, and conversion to an oxide for disposal. Results indicated that except for some severe accidents that might occur at conversion or storage facilities or during transportation and except for disposal in a wet environment, the impacts would generally be low and meet the requirements of currently applicable standards and regulations. EAD's analysis results helped DOE choose a management strategy.

History/Status/Future

EAD has been a major participant in helping DOE rethink its depleted UF_6 management strategy. The information in the PEIS directly influenced DOE's initial decisions and will also affect subsequent strategy implementation. By participating in the program, EAD staff have developed expertise to contribute to future DOE material management activities. As the program moves into the implementation phase, EAD will continue its technical support to help DOE assess the environmental, health, and safety risks associated with its chosen depleted UF_6 management strategy and communicate its findings to the public and regulators.

Communication of Results

EAD used Web technology to disseminate public information and to facilitate public outreach. It developed the DUF_6 Web site to explain the program to the public and collect their comments. The use of this site increased the public's ability to participate in the process and broadened the base of public interest in the program as a whole. In the implementation phase of the DUF_6 Program, this site will be used to involve industry and regulators in program activities.
(http://web.ead.anl.gov/uranium/)



Typical depleted UF_6 storage cylinder (Cylinders are constructed of steel, with the majority of cylinders having a 14-ton capacity.)

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